MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

PCM0016 – CHEMISTRY

(All sections / Groups)

10 AUGUST 2022
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 2 pages only excluding the cover page.
2. Attempt **ALL** questions. Distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.

QUESTION 1 [25 MARKS]

(a) The elements below belong to the same period. The symbols for *P*, *Q*, *R*, *S* and *T* are not the actual symbols. Answer the questions that follows:

Element	***P***	***Q***	***R***	***S***	***T***
Atomic no.	11	13	16	17	18

(i) Which element has the highest electronegativity? [1 mark]
(ii) Which element/s has the tendency to form cation(s)? [1 mark]
(iii) Which element is a noble gas? [1 mark]
(iv) Classify the oxide of element *Q* as either acidic, basic or amphoteric. [1 mark]

(b) Draw the electronic configuration of:

(i) ^{21}X
(ii) K^+
[4 marks]

(c) Differentiate ionic and molecular compounds. Give one example (name and symbol) for each compound. [4 marks]

(d) 80 gram of Rb is allowed to react with 50 gram of $MgCl_2$ to produce Mg and RbCl.
[Atomic mass: Rb = 85.5; Mg = 25.0; Cl = 35.5]

(i) Write the balanced equation for the above reaction. [1 mark]
(ii) Find the limiting reagent and the excess reagent. [4 marks]
(ii) Find the mass of remaining reactant at the end of the reaction. [2 marks]

(e) A gaseous compound contains nitrogen and oxygen only. A sample of the gas weighs 0.51 gram in a 300 mL container at a pressure of 700 torr and a temperature of 23 °C. Calculate the molar mass of the gas.
[Atomic mass: N = 14.0; O = 16.0; the universal gas constant, R = 0.0821 L.atm/mol.K]
[3 marks]

(f) Calculate the heat released when 1.5 L of $H_2(g)$ with a density of 0.09 g/L is allowed to react with an excess $Cl_2(g)$ at 25°C and 1 atm to form $HCl(g)$.
[$\Delta H°_f$(HCl) = -92.17 kJ/mol] [3 marks]

Continued...

QUESTION 2 [25 MARKS]

(a) The pH of a 0.25 M HW solution is 3.92 at 400 K. Write an expression for the acid dissociation constant, K_a, of HW, and determine the value of K_a at 400 K. [5 marks]

(b) To produce a 3.0 L solution of $Co(OH)_3$ with pOH 4.19, x gram of hydroxide powder is needed. Find x. [Atomic mass: Co = 59.0; H = 1.0; O = 16.0; C = 12.0] [4 marks]

(c) For the reactions below, label the Brønsted-Lowry acids and conjugate bases.

(i) $H_3O^+ + HSO_4^- \rightleftharpoons H_2SO_4 + H_2O^-$

(ii) $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$ [4 marks]

(d) Calculate the number of grams of Pb deposited in an hour by the electrolysis of molten $PbBr_2$ by a constant current of 12 A.
[Atomic mass: Pb = 82; Faraday constant = 96500 C/mol e^-] [3 marks]

(e) Complete the table below.

Molecule	**Lewis structure**	**Lone pair(s) @ central**	***AB_mE_n***	***VSEPR* Geometry**
NF_3				

[5 marks]

(f) Consider the following reaction to produce C.

$$A\,(g) + B\,(g) \longrightarrow C\,(g)$$

Determine each of the following:

(i) If A is a zero order of kinetics and B is a second order of kinetics, find the rate (M/s) in multiplication factor if the concentration of A is doubled and B is halved. [2 marks]

(ii) State the overall order of the reaction and find the unit of rate constant, k for the reaction. [2 marks]

End of question